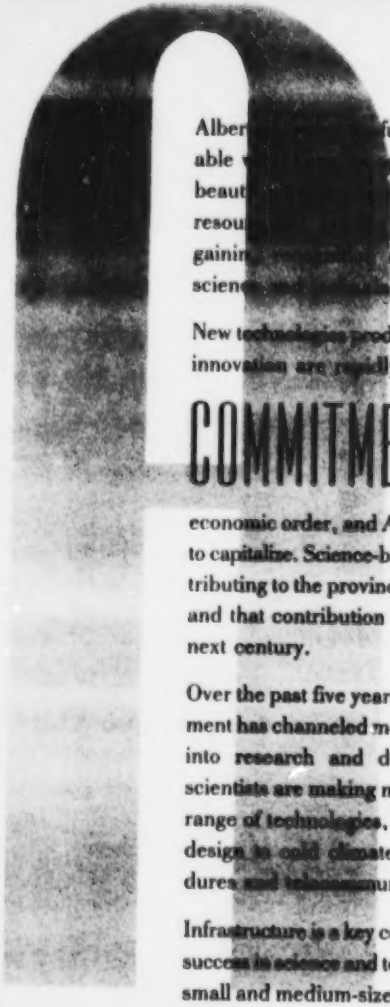
Today, more than 1,200 technology intensive companies and organisations in Alberta generate billions of dollars in revenue and employ over 50,000 people.



COMMITMENT TO INNOVATION

Alber[illegible]future in a most remarkable [illegible]gnized for its stunning beaut[illegible]ural resources and the resou[illegible]people, Alberta is now gainin[illegible]as a world leader in scienc[illegible]gy.

New technologies produced by science-based innovation are rapidly changing the global economic order, and Alberta has been quick to capitalize. Science-based innovation is contributing to the province's economic growth, and that contribution will continue into the next century.

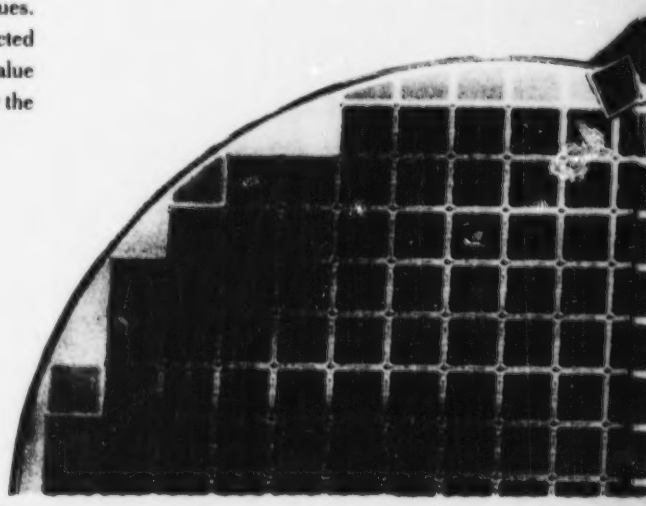
Over the past five years, the Alberta government has channeled more than $900 million into research and development. Alberta scientists are making major strides in a wide range of technologies, from lasers to circuit design to cold climate construction procedures and telecommunications.

Infrastructure is a key component of Alberta's success in science and technology. In Alberta, small and medium-sized companies have an opportunity to develop advanced technology ideas using the same kind of research capability that is usually enjoyed only by larger multi-national corporations.

New institutions have been created to aid the transfer of new technologies from laboratory to marketplace. Research and development parks with business incubators have been established to accommodate the needs of advanced technology companies. And responsive sources of financial assistance have been created to help turn good ideas into viable businesses.

Technology intensive companies in Alberta spend about $250 million per year on research-related projects. They are rapidly translating scientific research into consumer goods in areas such as electronics, telecommunications, information technologies, biotechnology, advanced materials and advanced manufacturing.

Today, there are over 1,200 technology-intensive companies and organizations in the province, employing over 50,000 people and generating billions of dollars in revenues. Technology-intensive industries are expected to account for nearly 25 per cent of the value of Alberta's manufacturing shipments by the year 2000.



A strong history of research and development and abundant natural resources have helped create a superb environment for advanced technologies in Alberta.

BUILDING ON OUR STRENGTHS

Alberta's commitment to science and technology is not new. Research and development is a part of the province's dynamic history, playing a vital role in Alberta's growth and prosperity.

The roots of the province's vast R & D network go back to an experimental farm established in the 1890s by the Canadian Pacific Railroad at Brooks. Today, the Horticultural Research Centre at Brooks is a major centre of research in Western Canada for all aspects of crop production.

Other historic steps included:

***Lethbridge Experimental Farm* (founded in early 1900s)** Created by Agriculture Canada, the farm is now Canada's largest federal agricultural research station.

University of Alberta (1908) Located in Edmonton, the University of Alberta has grown to become Canada's second largest university, with a student body of over 30,000. The university has a long tradition of research excellence which has gained momentum in recent years due to government support of first-class facilities as well as recruitment of talented scholars to the province. The university currently embraces more than 30 research-based institutes and employs more than 1,700 academics.

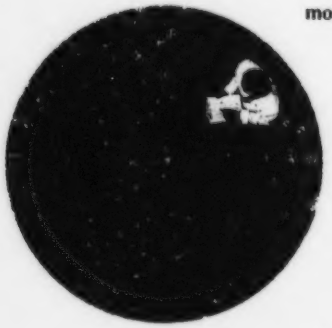
Alberta Research Council (1921) The Alberta Research Council is the oldest and largest provincial research organization in Canada. Early work by Dr. Karl Clark in developing a hot water extraction process for separating bitumen from mined oil sands led to the Research Council's first patent, granted in 1929. The oil sands operations of Syncrude Canada Ltd. and Suncor Inc. near Fort McMurray, Alberta, are based on Clark's process. Today, with 600 employees, the Research Council offers a diversified range of scientific, engineering and testing capabilities in advanced computing, biotechnology, forest products, environmental research and engineering, coal research, advanced manufacturing, coal and oil sands research, Geological Survey and the Electronics Test Centre.

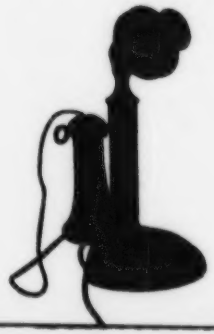
The University of Calgary (1966) The University's strong research orientation has led to the development of large concentrations of expertise in fields ranging from genetic engineering, biotechnology and cardiovascular research to computing technologies and microelectronics.

Alberta's abundant resources and free enterprise environment have attracted industries looking for new and exciting opportunities for expansion. Industrial research in Alberta expanded rapidly in the 1950s with the establishment of laboratories by ESSO Resources Canada Limited, CIL Inc., Sherritt Gordon Limited, Dow Chemical Inc. and Celanese Canada Inc.

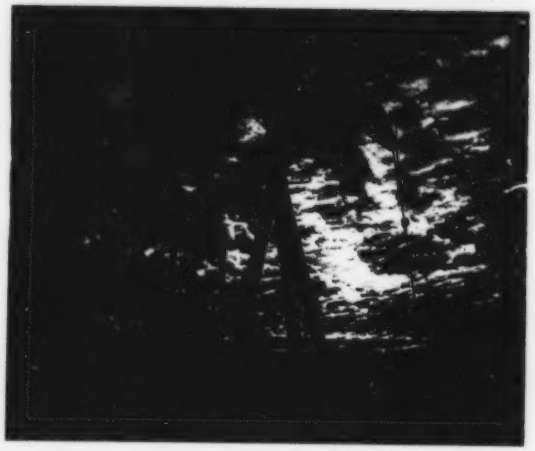
Syncrude Canada Ltd. began its oil sands research lab in 1964. Further major expansion of industrial research occurred in the 1980s with the establishment of R & D facilities in Alberta by a number of large national and multi-national companies including Petro-Canada Inc. and Shell Canada Resources Limited, as well as Alberta-grown NovAtel Communications Ltd., TransAlta Utilities Corporation and Nova/Husky Research Corporation.

Research has always been a high priority of the Alberta government. In the 1970s, the government underlined its commitment to R & D with the establishment of two major players in the province's research network:





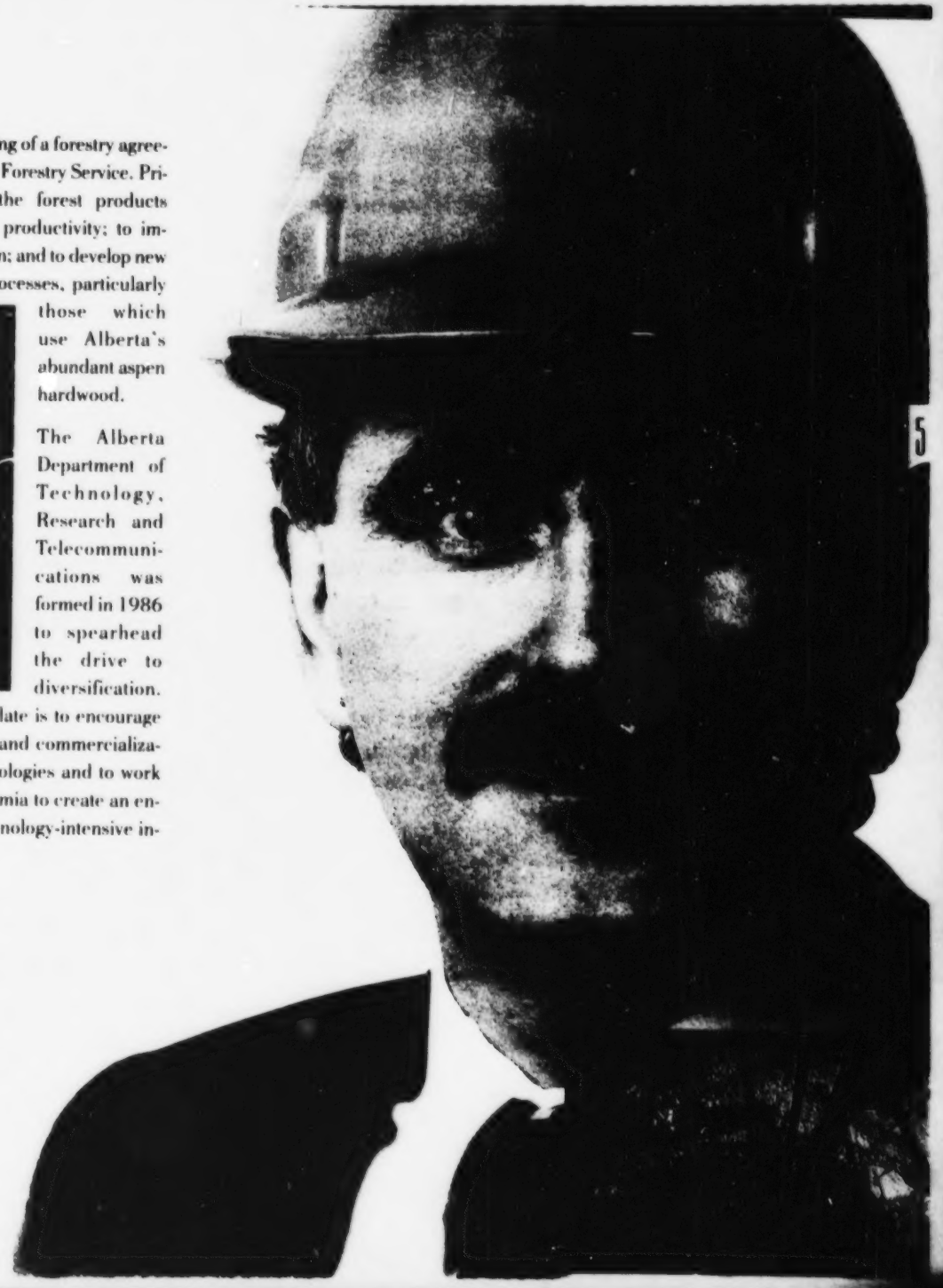
Alberta Oil Sands Technology and Research Authority (AOSTRA) Established in 1975, AOSTRA was created to fund research on oil sands and tertiary recovery of conventional crude oil in industry, universities and institutions such as the Alberta Research Council. AOSTRA and the private sector have each contributed $500 million to research and development in this area.



In 1984, the Office of Coal Research and Technology and the Devon Coal Research Centre were established to help Alberta's coal industry implement new technologies to enhance the competitiveness and marketability of the province's coal reserves, which account for 70 per cent of Canada's total deposits.

The same year, extensive research programs carried out by the Alberta Forest Service were expanded with the signing of a forestry agreement with the Canadian Forestry Service. Priorities are to assist the forest products industry in increasing productivity; to improve resource utilization; and to develop new forest products and processes, particularly those which use Alberta's abundant aspen hardwood.

The Alberta Department of Technology, Research and Telecommunications was formed in 1986 to spearhead the drive to diversification. The department's mandate is to encourage research, development and commercialization of innovative technologies and to work with industry and academia to create an environment in which technology-intensive industries can thrive.



CORNERSTONES AND BUILDING BLOCKS

Alberta's extensive advanced technology infrastructure includes the Alberta Oil Sands Technology Research Authority, the Alberta Heritage Foundation for Medical Research and the Alberta Research Council (lower right).

A solid infrastructure is essential to a dynamic advanced technology industry. The Alberta government recognized this early and took the initiative. Three key agencies - the Alberta Research Council, the Alberta Oil Sands Technology and Research Authority and the Alberta Heritage Foundation for Medical Research - provide a solid foundation for supporting Alberta's technological advancement.

As well, co-operative efforts of government, industry and the universities have created an extensive and impressive system of institutions providing infrastructure services. The result is a wealth of resources - from pilot plants to business incubators to venture capital funds - available for companies seeking to commercialize innovative technologies.

Alberta Research Council With headquarters in Edmonton and facilities in Calgary, Devon, Red Deer, Nisku and Lethbridge, the Alberta Research Council works closely with industrial clients to develop innovative technologies with commercial applications. Its joint research venture programs allow companies to work with the Research Council on a cost-shared basis.

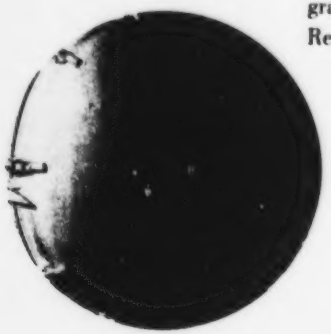
The Alberta Research Council provides technical advice and assistance to business and industry, while launching longer-term research in fields such as computer-based advanced technologies, energy research and advanced manufacturing. In Edmonton, the Alberta Research Council houses the Electronics Test Centre, a biotechnology pilot plant which is the largest of its type in public ownership in the world, and forest products testing laboratories. In Calgary, the Research Council's facilities include a robotics laboratory and the Advanced Manufacturing Demonstration testbed.

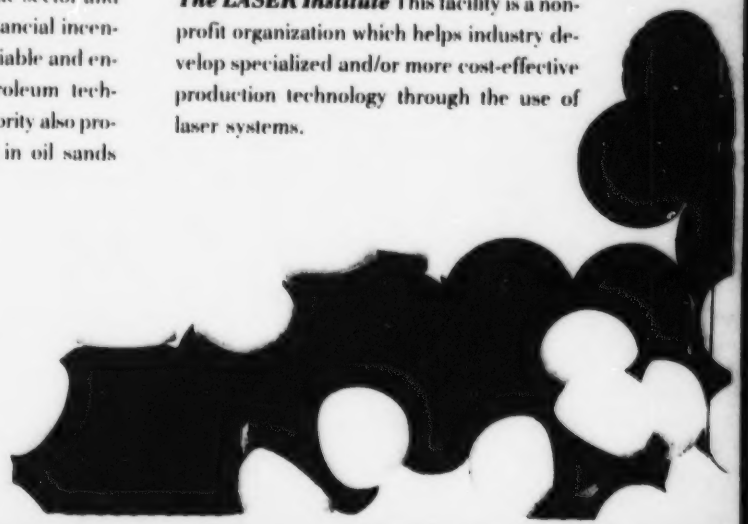
Alberta Oil Sands Technology and Research Authority (AOSTRA) Headquartered in Edmonton, AOSTRA pursues new technology for oil sands and heavy oil recovery and enhanced techniques for conventional crude oil recovery. AOSTRA's mandate is to provide the private sector and research organizations with financial incentives to develop economically viable and environmentally acceptable petroleum technology in these areas. The Authority also promotes education and training in oil sands development by funding scholarships, fellowships and professorships.

Alberta Heritage Foundation for Medical Research (AHFMR) Since its creation in 1979 with a $300 million endowment from the Alberta Heritage Savings Trust Fund, the AHFMR has produced a medical research milieu unmatched anywhere in the world. The Foundation has contributed $315 million directly to the scientific community to support research in a wide variety of areas. These funds have supported 145 senior scientists recruited from Canada and around the world, trained 2,500 students and provided equipment for hundreds of laboratories.

Heritage Medical Scientists are pioneering advances in basic science, forefront medical technology and innovative patient care. A University of Calgary cardiac research group is pioneering ways to diagnose heart disease and a University of Alberta team of neuroscientists is pioneering electrical stimulation therapies for paralyzed patients.

The LASER Institute This facility is a non-profit organization which helps industry develop specialized and/or more cost-effective production technology through the use of laser systems.





The Institute is the first centre in Canada oriented towards the industrial application of laser technology. Emphasis is on materials processing, laser sensors, metrology, machine vision and medical applications. The Institute's advanced high power laser-based metal-working machinery forms the core of one of the most modern laser materials processing centres in North America.

Alberta Environmental Centre Opened in 1981 in Vegreville, the Alberta Environmental Centre is Canada's first interdepartmental, interdisciplinary environmental research and service organization. Over $50 million has been invested in the Centre to date.

Alberta Telecommunications Research Centre (ATRC) Established in 1986 as an industry-university-government consortium in applied telecommunications research, this non-profit corporation has grown from the original three charter sponsors (Bell Northern Research, the University of Alberta and the Government of Alberta) to eleven sponsors that include Alberta Government Telephones, Edmonton Telephones, LSI Logic Corp. of Canada and Digital Equipment of Canada. With laboratories in Edmonton and Calgary, the Centre works with industry on joint research and development in telecommunications. Participating industries have access to processes, systems and patents developed by the Centre. Expert assistance is available through contract research for companies wishing to develop new technologies and innovative products.

Research focuses on telecommunications networks and systems, photonics and optical communications, and wireless communications. The ATRC puts out technology in the form of computer models, prototypes and proofs of concepts as well as technology transfer agents in the form of graduating students and industry professionals returning to the field after assignment at the Centre.

Electronics Test Centre The Electronics Test Centre has launched a new age in the development of the electronics industry in Alberta. The Centre provides testing and certification for electronic products, as well as product evaluation and consulting for manufacturers. The services of the Centre are available to designers, manufacturers, distributors, import purchasers and government agencies.

Outstanding research facilities, business incubators and financial incentives combine to make Alberta attractive to entrepreneurs in the 1990s.

The facility, located at the Alberta Research Council in Edmonton, includes laboratories for environmental testing, terminal attachment testing, product safety testing, product integrity and electromagnetic interference testing using an anechoic chamber and an open field test site.

Alberta Microelectronic Centre (AMC) This non-profit corporation was established at the University of Alberta and later expanded to The University of Calgary. The Centre assists Alberta's rapidly growing electronics industry with the application and implementation of microelectronics technology to their business.

The Centre's Edmonton Fabrication Facility, specializing in custom-designed silicon chips, is Canada's first university-based microchip manufacturing plant. It complements the Centre's Design and Engineering Application facility in Calgary. LSI Logic Corp. of Canada Inc. works closely with the Centre in developing custom microchips for use in a variety of products.

Biotechnology Pilot Plant The Alberta Research Council's $18 million biotechnology pilot facility acts as a bridge between laboratory research and production of new products in biochemical processing, agriculture and pharmaceutical research. The pilot plant focuses on the development of efficient processes to help companies bring their products to commercial production quickly and economically.

The pilot plant offers the only contract fermentation facility of its kind in Canada. The facility is equipped with a full range of fermentation and downstream processing equipment with volumes ranging up to 15,000 litres. Serving local, national and international clients, the pilot plant is making Alberta a major production centre for the growing biotechnology industry in North America.

Centre for Frontier Engineering Research (C-FER) The Centre for Frontier Engineering Research is a not-for-profit research institute established in 1983 as a national centre of excellence. Initially located on the University of Alberta campus, C-FER moved to its new $18 million research centre in the Edmonton Research Park in May, 1990.

C-FER's mandate is to develop effective solutions for the safe and economical development of Canada's energy resources. The Centre is an industry-driven organization, committed to meeting the needs of its members. Research in Offshore and Marine Technology, a program related to the geographical frontiers of the Arctic and offshore, was the first major area of investigation. This was soon followed by the addition of research in Downhole Technology, investigations linked to the technological frontiers of Canada's conventional, heavy oil and oil sands operations.

OTHER SUPPORT SERVICES

The success rate for new businesses can be improved by as much as 60 per cent in an incubator setting. Recognizing this, the Alberta government offers financial support for the development of business incubators which provide such services as shared administrative support, business counselling assistance, management training and access to seed capital.

Alberta boasts five major multi-tenant research facilities, including:

Discovery Place I, a project of the Calgary Research and Development Authority; and the Edmonton Advanced Technology Centre, a project of the Edmonton Research and Development Park Authority.

Alberta also features two outstanding research parks offering a stimulating environment for advanced technology activity: the Edmonton Research and Development Park,

adjacent to the headquarters and laboratories of Alberta Research Council; and University Research Park, adjacent to the University of Calgary.

Financial Initiatives Good ideas need responsive sources of capital to be transformed into viable businesses. Sensitive to this need, the Alberta government has launched a variety of financial initiatives to encourage businesses to develop innovative technologies and products.

Vencap Equities Ltd. is a venture capital company with assets under administration exceeding $290 million. Vencap is a publicly traded, private-sector corporation that is facilitating the long-term economic diversification of Alberta by attracting technology and new innovations to the province, by assisting in the creation of new companies in Alberta and by supporting the growth of existing business. Vencap was created with the financial support of the Government of Alberta.

Alta-Can Telecom Inc., a subsidiary of TELUS Corp., invests in private sector ventures in microelectronics and telecommunications and offers assistance in manufacturing goods with international marketing potential. The company also manages SPURT Investment Fund 1, a private/public sector initiative designed to support emerging advanced technology with equity investments at the high-risk conceptual, research or prototype stage of development.

Alberta Opportunity Company, a crown corporation, offers management and financial assistance in the form of equity, loans or loan guarantees to Alberta small businesses where conventional financing is not readily available.

Alberta Capital Loan Guarantee guarantees 80 per cent of a maximum $100,000 loan for a five year term at participating financial institutions and can be used for fixed assets or working capital.

The Loan Guarantee Program for Alberta Exporters provides support to Alberta-based businesses which are exporters or potential exporters of manufactured products. The program's objective is to increase the working capital available to Alberta-based manufacturers by providing partial guarantees of loans made by chartered banks, Treasury Branches and other financial institutions to a maximum of $5 million, provided such loans relate to specific export contracts or orders.

The Alberta Medical Innovation Program, administered by the Alberta Heritage Foundation for Medical Research, was established to assist Alberta businesses and entrepreneurs in prototype development, testing and clinical trials of promising new drugs and medical devices and complements existing technology transfer initiatives of the AHFMR.

Vibrant technology transfer programs are a priority at the University of Alberta, The University of Calgary and the University of Lethbridge (lower right).

TECHNOLOGY TRANSFER

The starting point of great technological advances is often the university laboratory. In disciplines as far ranging as laser technology and genetic engineering, Alberta's scientists are leaders in their fields.

Alberta's major universities have aggressive technology transfer programs. And their scientists welcome opportunities to work closely with industry to develop innovative technologies with commercial potential.

University of Alberta The University of Alberta is developing a position of leadership in technology transfer. Many new products such as lasers, biologicals and pharmaceuticals emerge from and remain linked to university research programs. Transfer of these technologies is made possible through patents, licenses, contract arrangements, joint ventures, university enterprises, co-operative arrangements with infrastructure organizations, contract research and a range of industry-university interactions. Contract research during 1989-90 amounted to more than $8.6 million.

Five of the major faculties - Medicine, Pharmacy, Engineering, Science, and Agriculture and Forestry - are major participants in technology transfer activities involving leading edge research. In addition, the Faculty of Business, together with the Management Advisory Institute, assists businesses and inventors in the development of business strategies.

Health sciences research has been greatly expanded due in large part to support from the Alberta Heritage Foundation for Medical Research. Research in this area accounts for nearly half of total sponsored research on campus. Strong financial support and the atmosphere of growth are attracting leading scholars from around the world.

The University of Alberta has a strong commitment to university-industry partnerships which capitalize on technologies and innovations developed by its professors.

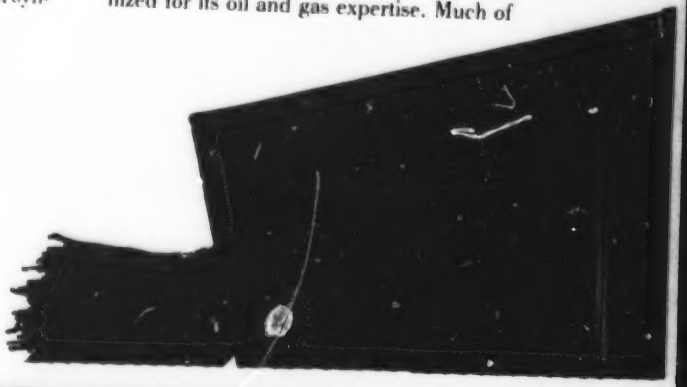
Business ventures include: CHEMBIOMED Ltd., which leads the industry in quantity synthesis of biologically active carbohydrates for human and animal health care; Biomira Inc., which was established to produce and market products for cancer diagnosis and therapy; Synthetic Peptides Inc., which is commercializing groundbreaking research in peptide and protein engineering; and SynPhar Laboratories Inc., which aims to design, synthesize and test potential new antibiotics, antivirals, anticancer and antifungal agents.

The University of Calgary Research funding at The University of Calgary's Faculty of Medicine totalled $32.7 million for 1989/90 and is projected to be $34 million for the 1990/91 term. The Faculty has the highest concentration of reproductive physiologists and one of the largest concentrations of expertise in genetic engineering and biotechnology in Canada. The group has worked closely for many years with Alberta Livestock Transplants Ltd., the first company in the world to specialize in embryo transfer. The Faculty's Regional DNA Synthesis Laboratory serves all of Western Canada; its Protein Engineering Laboratory provides custom peptide synthesis.

The University's Cardiovascular Research Group is one of the few in North America to cover the spectrum from laboratory study of single heart cells to clinical research with cardiac patients.

The University's research in microelectronics is strongly oriented to industrial and commercial needs, spanning the full range from design through application.

The University of Calgary is widely recognized for its oil and gas expertise. Much of



its research in this area has translated into commercially viable products, processes and techniques.

The University has gained a strong reputation, particularly in the United States and Europe, for its work in exploration geology and geophysics. A large part of this research is funded by the Canadian oil and gas industry. Because of the University's close working relationship with the industry, its particular strengths and interests often parallel or lead current industry concerns.

Important research initiatives in chemical engineering, satellite navigational systems and digital mapping have led to newly funded research projects.

The Department of Chemical and Petroleum Engineering is at the forefront of software development for computerized reservoir simulation. The Computer Modelling Group, an industry-sponsored affiliate of the University, was a spin-off from this work and is today a leader in reservoir simulation and modelling.

University Technologies International Inc. (UTI) is a subsidiary corporation of The University of Calgary, whose mandate is to transfer technologies and products developed at the University and Foothills Hospital to the private sector. By doing so, The University of Calgary is able to make significant contributions to the community through the creation of new business and employment opportunities.

University of Lethbridge Advanced technology research at the University of Lethbridge will have an impact in fields ranging from agriculture to astrophysics. Exciting developments in infra-red spectrophotometry, detection, recording and analysis have led to major improvements in sensitivity and accuracy of instrumentation with potential applications in industry and medicine.

Other work, on the development and control of gibrillin activity in plant growth, promises to have major implications for the control of plant height and yield.

Both theoretical and applied studies are being done in the field of surfaces, involving definition of properties and chemical reaction.

Alberta's advanced technology and research companies are creating a blueprint for a better tomorrow.

MILESTONES OF OUR SUCCESS

The over 1,200 advanced technology and research companies in Alberta are writing their own success stories, across Canada and around the world. In areas such as electronics, telecommunications, information technologies, biotechnology, advanced materials and advanced manufacturing, Alberta's innovative advanced technology and research companies are creating a dynamic environment, rich in diversity, change and opportunity. The following are just a few examples of Alberta's advanced technology successes.

TELUS Corporation is Alberta's primary supplier of telecommunications and information management systems and is a key player in Alberta's advanced technology sector. As Canada's third largest telecommunications company, TELUS generates over $1 billion in annual revenues and employs more than 12,000 Albertans.

Northern Telecom Limited is one of Alberta's largest advanced technology companies with more than 1,200 employees at three locations who help develop, manufacture and market advanced telecommunications products for the domestic and global marketplace. Northern Telecom's Business Products Division manufactures the Meridian Norstar, one of the few telephone systems made entirely in North America. The Meridian Norstar is marketed to over 40 countries around the world.

NovAtel Communications Ltd. is the only Canadian manufacturer of cellular telephones and systems and is ranked as one of the top suppliers of cellular phones in the world. The company is also making history by supplying one of China's larger cities with the first cellular telecommunications system used in place of a wired system.

Companies such as DATAP Systems, Westronic and Willowglen Systems Ltd. are using advanced computing to create next-generation SCADA (Supervisory Control and Data Acquisition) products and systems. SCADA systems allow a control centre to make accurate and informed decisions about remote facilities.

LSI Logic Corporation of Canada is leading the way in computer chip manufacturing. The company's Edmonton plant is the Canadian centre for the manufacture of ASICs (Application Specific Integrated Circuits). LSI is supplying ASICs for Apple Canada's Singapore plant, to be used in one of Apple's new computers.

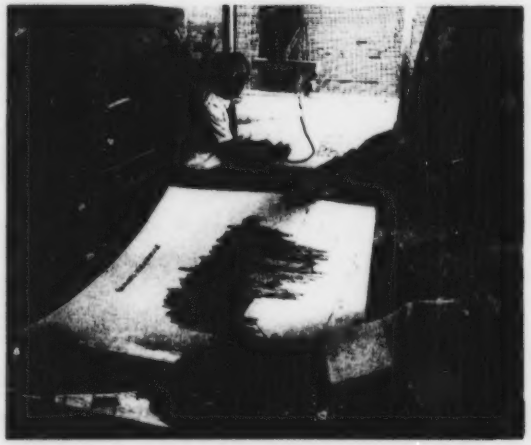
INTERA Technologies Ltd. is a world leader in remote sensing with a $58 million ice surveillance project in northern Canada, a $30 million mapping project in South America and several multi-million projects in countries such as Indonesia, Malaysia, Burma and the Philippines. INTERA is also a partner in RADARSAT, Canada's first earth observation satellite, to be launched in 1994.

Biotechnology company Alta Genetics Inc. is leading the way in advanced embryo transplant techniques to improve cattle breeding. The company's scientific expertise includes technologies associated with bovine embryo transfer as well as various micromanipulation procedures. Alta Genetics' expertise led to the first biotechnology joint venture between Canada and the Soviet Union.

Three dimensional sound developer Archer Communications is making its mark on the entertainment industry. After signing a deal with Japanese video game giant Nintendo Co. Ltd., Archer lined up a string of pop stars to produce QSound-enhanced albums,

including Sting, Madonna, Janet Jackson, Stevie Nicks and Julian Lennon.

Synphar Laboratories Inc. is the first pharmaceutical research and development company in western Canada. Currently in the research and development phase, the firm aims to design, synthesize and test potential new antibiotics, antivirals, anticancer and antifungal agents, as well as conduct research and development into new methods of targeting drugs.



WESTAIM is a new world-class organization established by Sherritt Gordon, the Government of Alberta and the Government of Canada. The $140 million project is aimed at commercializing advanced materials research and development. When fully operational, WESTAIM will maintain a staff of over 200 scientists, researchers, technicians and support personnel in applied research and development in the aerospace, electronic, process and energy sectors of the economy.

Alberta boasts many advantages, including a quality of life and prosperity that few in the world can match.

LBERTA: THE OBVIOUS CHOICE

Rapidly advancing technologies create a multitude of opportunities almost daily for the entrepreneur. The challenge is to pick a winner for all the right reasons. The choice is obvious. Alberta is an exciting place to be, now and in the future. Here's why.

A Dynamic Economy Buoyed by a strong free enterprise philosophy and stable political system, Alberta's economy is forging ahead. In 1989, with 9.1 per cent of Canada's population, Alberta accounted for about 10.4 per cent of Canada's total domestic production, demonstrating the confidence investors have in the future strength of the Alberta economy. Alberta has made a major commitment to economic diversification with particular emphasis on advanced technologies. Through the Department of Technology, Research and Telecommunications, the government has helped to create a technologically rich environment which has already accelerated the growth of the advanced technology sector.

A Skilled Labor Force Alberta has a young, skilled work force, trained at the province's four universities, its community colleges and technical institutes. The province enjoys a participation rate of 72.4 per cent, the highest of any Canadian province. Nearly one in every 100 Albertans is an engineer, giving Alberta more engineers per capita than any other Canadian province and almost as many per capita as California. In addition, on a per capita basis, Alberta has the highest concentration in Canada of workers engaged in science, engineering and math-related occupations.

Links to World Markets Alberta succeeds because of its capability as an exporter. Alberta is well-connected to its world markets through a modern network of road, rail, air and pipeline facilities. Efficient, low-cost intermodal facilities are located in Edmonton and Calgary with excellent highway feeder services from other areas of the province. Initiatives are underway to create additional intermodal transportation services.

The province has particularly well-established trade links with the United States and countries in the Pacific Rim. Overseas markets are accessed primarily through the ports of Vancouver and Prince Rupert in British Columbia, the port of Thunder Bay on Lake Superior and the Port of Montreal in Quebec.

Incentives Investors seeking opportunities in emerging technologies will find an extensive advanced technology infrastructure in Alberta. A number of government agencies are prepared to assist in selecting industrial sites, starting or expanding production, developing products or processes, developing markets and accessing technical information. Several programs exist to provide financial support, through grants or export loan guarantees.

Appealing Lifestyle Alberta combines the serenity of the Rocky Mountains and northern wilderness with the excitement of industrial progress and modern metropolitan lifestyles. Few places in the world can match the quality of life and prosperity enjoyed by Albertans.

Alberta indoor and outdoor recreation ranges from exploring the natural beauty of the Rockies to enjoying world-class sports facilities. The performing arts offer the best in symphony, ballet, opera and theatre. Alberta offers superb downhill, cross-country and heli-skiing opportunities, while golfers can choose from more than 250 golf courses. West Edmonton Mall, the world's largest retail and entertainment complex, headlines Alberta's extensive shopping opportunities.